Petr Stepanov

`Materials science. Software development. Data analysis and computer simulations.`

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Summary

Ph.D. graduate with expertise in gamma spectroscopy, positron annihilation spectroscopy, microscopy, and nuclear physics. Strong background in computational techniques: data anayysis, particle simulations, software development (desktop and web applications).

Graduated from BGSU in May 2020. Seeking to become an effective member of a research group in the industry. Authorized to work in the US on Optional Practical Training (OPT) in physics, chemistry, and computer science. OPT expires in February 2023. Will consider visa sponsorship offers.

Computer Science Skills

- **Essentials**. Git, SVN, SSH, Linux, and Terminal usage. BASH scripting. IDEs: Eclipse, Xcode, Visual Studio Code (VS Code). Project management: JIRA, Trello.
- **Simulation and data analysis**: Geant4, CERN ROOT, MATLAB, Wolfram Mathematica, Maple.
- **Academic writing**: LaTeX, MS Office Suite, Zotero.
- **Data plotting**: Gnuplot, OriginLab, QtiPlot, SciDaVis, Grapher.
- **Desktop app development**. C/C++, GNU make, CMake. Frameworks: Qt, CERN ROOT, Geant4. Java and Swing. Python.
- **Frontend**: HTML, CSS (LESS and SASS), Bootstrap, responsive web design, JavaScript and jQuery, npm, gulp, AngularJS, React.js. Google Web Toolkit. PHP and WordPress themes development.

Material Research Skills

- **Characterization facilities**. Positron Lifetime and Doppler Broadening Annihilation Spectroscopy (PALS, DBAR). Atom Probe Tomography (ATP). Scanning Electron Microscopy (SEM). Transmission electron microscopy (TEM). Atomic Force Microscopy (AFM). UV-VIS Spectroscopy. Fourier Transform Infrared Spectroscopy (FTIR).
- **Material processing**. High-temperature annealing. Wet chemical etching. Electrical Contact Fabrication. Sample polishing.

Work Experience

Research Collaborator (On-Site)

Thomas Jefferson National Laboratory (JLab), Newport News, VA, USA. **Jul 2020 - Current**

- Applied CERN ROOT framework (C++) to perform statistical analysis of a significant amount (over 100 GB) of the raw experimental data of the Kaon LT experiment at JLab. Link to GitHub.
- Utilized SLURM environment on JLab supercomputer environment to run resourceful particle simulations on multiple computing nodes at the same time. This decreased the wall computation time by more than 10 times.
- Proposed and implemented RAMDisk functionality on the development environment. This lead to an over 60% increase in source code indexing time.
- Set up data acquisition system that performs triggered waveform acquisition from Tektronix oscilloscope to a local Network Attached Storage (NAS) device. RedHat, Ethernet, SAMBA, Python, National Instruments VISA library.
- Committed 50+ shifts at the particle accelerator performing Target Operator and Shift Leader duties (Pion LT project, experimental Hall C).

Postdoctoral Researcher (Remote)

Catholic University of America (CUA), Washington, DC, USA. **Jul 2020 - Current**

- Applied Machine Learning (ML) TMVA framework to perform binary classification of thousands of signals from a data acquisition (DAQ) setup. Link to GitHub.
- Developed a computer simulation based on the Geant4 framework (C++, CMake, Eclipse IDE, gdb) to study optical properties of a novel scintillation material to be used in the EIC detector system. Link to GitHub.
- Teaching experience: mentoring students within a 3-month Research Experiences for Undergraduates (REU) program at the Physics Department at CUA. Giving talks and presentations about Linux Terminal, and supercomputer environment.
- Enhanced debugging of the core library source code lead to opening more than 10 bug reports on the ROOT (C++) forum.

Research Assistant

Bowling Green State University (BGSU), Bowling Green, OH, USA. **Aug 2014 - May 2020**

- Applied ROOT C++ libraries to write three GUI open-source software for scientific data interpretation.
  - GitHub repositories contain over 10k lines of code in total: TLIST Processor, SW Calculator, RooPositron.
  - Technologies used: CMake, C++, ROOT, Fox GUI and RooFit libraries.
  - Extended default ROOT GUI library (Qt-based) to support the MVP design pattern.
- Wrote a GUI application LuminApp (Java, Swing) to parse and merge time-stamped data from optical spectrometer and thermometer. This increased data processing time by two orders of magnitude.
- Developed static website (Hexo, Gulp, Bootstrap) and visual identity for the SelimLab research group. Website has a 99% Google performance rank and features 700 ms time to interactive metrics.
- Maintained local Apache HTTP server physics.bgsu.edu hosting over 10 websites at the BGSU.
- Created website for the ICPA-18 international conference with registration (over 150 users) and payment system workflow (WordPress, PHP, Recurly.js), and landing pages for events.

Frontend Developer, UI/UX Designer • Freelance **Sep 2012 - Current**

- Designed and built online e-commerce store Sticker Store LLC with static website generator (Figma, Hexo, Snipcart, Bootstrap, SASS, EJS, Node.js).
  - Improved the Google PageSpeed Insights metrics (CLS, LCP) up to 97%.
  - Created a recursive script to export over 300 products from YAML file to Google Merchant.
  - Optimized SEO. Project reached over 1400 organic monthly users.
- Made iOS application (Swift, UIkit, storyboards) for the We.Team messenger (more than 3k monthly downloads in AppStore). Participated in cloud-based messenger development with enhanced file sharing capabilities (HTML, React JS, SASS).
- Migrated the landing page for Sweetbridge company from WordPress to Jekyll static site generator (Ruby, CSS). This resulted in a 70% improvement in the page load time.
- Developed the front-end part (Angular.js, HTML, LESS) for Lili Social network.
  - Assisted with iOS mobile application (Ionic).
  - Enabled SEO crawling of over 1000 Angular.js pages with Google bot.
- Web design.
  - Designed logos, UI/UX prototypes (Figma, Sketch, Illustrator) and branding identity for over 10 different companies.
  - Converted numerous design assets and mockups into responsive HTML and CSS.
  - Mocked up and integrated dozens of cross-browser responsive email templates.

Full Stack Web Developer, Web Designer

Gridnine Systems, Moscow, Russia. **Apr 2011 - Aug 2014**

- Prototyped and designed interactive mockups for Otixo cloud file integrator (Balsamiq, Adobe Creative Suite). Utilized Google Web Toolkit (GWT) Model-View-Presenter (MVP) framework to develop application frontend (JavaScript, responsive CSS).

- Responsible for the front-end development of the ATH American Express – the largest travel management company in Russia (JavaScript, Backbone.js, and RequireJS). Increased the front-end load time by over 30%.
- Implemented image processing servlets on the backend to generate banners for five different social networks (PHP, ImageMagic).
- Wireframed and sliced to web pages numerous UI/UX mockups for web applications (Balsamiq, Photoshop, HTML and CSS).

Computer Science Teacher

Phys-Tech College at MIPT, Moscow, Russia. **Oct 2009 - May 2011**

- Provided instructions and guidance to high school students on following computer courses: C/C++ programming, HTML, Adobe Photoshop and 3D Studio Max.

Research Scientist

Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia. **Sep 2008 - Apr 2011**

- Application of positron lifetime spectroscopy for studying the radioactive-induced defects in steels. Monte-Carlo particle simulations with Fortran 95. Maintaining software for CAMECA tomographic atom probe (MSVC). Application of CERN ROOT libraries for fitting and analysis of experimental spectra.

Education

Bowling Green State University (BGSU) • Ohio, USA **Aug 2014 - May 2020**

Ph.D. in Photochemical Sciences • GPA 3.423. Novel developments in positron annihilation spectroscopy techniques—from experimental setups to advanced processing software. View manuscript.

- Assembled and utilized two spectrometers: positron lifetime and Doppler. Spectrometers are built from ORTEC and Canberra (Mirion) fast electronic units and utilize High-Purity Germanium Detectors (HPGe) and scintillation-based detector systems.
- Developed open-source software (C++, CERN ROOT) for novel interpretation of the experimental spectra.
- Defined and resolved kinetic equations of reactions of positron and positronium atoms (Ps) in solids and liquids and nano-powders (Wolfram Mathemetica). Equation parameters are implemented in the fitting model of experimental spectra (RooFit).
- Above research allowed for estimation of defect concentrations and sizes in solids, classification of defect types (vacancies, dislocations) and more...

Ohio Supercomputer Workshop • Ohio, USA **Jan 2017 - Feb 2017**

Hands-on sessions in Supercomputer Essentials. Introduction to the key developments in the supercomputer field.

- RedHat and CentOS operating systems: environment, networking and SSH.
- Supercomputer job control with BASH and SLURM scripts.
- CMake compiling platform, use of parallel nodes, A.I. fundamentals and more..."

National Research Nuclear University (MEPhI) • Moscow, Russia **Aug 2014 - May 2020**

B.S. and M.S. in Solid State Physics. Defect studies of neutron-irradiated nuclear power plant vessel steels by means of positron annihilation spectroscopy.

Recent publications

- J. Arrington, C Ayerbe. Gayoso, P C. Barry, V. Berdnikov, D. Binosi, L. Chang, M. Diefenthaler, M. Ding, R. Ent, T. Frederico, Y. Furletova, T J. Hobbs, T. Horn, G M. Huber, S J D. Kay, C. Keppel, H-W. Lin, C. Mezrag, R. Montgomery, I L. Pegg, K. Raya, P. Reimer, D G. Richards, C D. Roberts, J. Rodríguez-Quintero, D. Romanov, G. Salmè, N. Sato, J. Segovia, P. Stepanov, A S. Tadepalli, R L. Trotta. Revealing the structure of light pseudoscalar mesons at the electron–ion collider
- P. S.. Stepanov, F. A.. Selim, S. V.. Stepanov, A. V.. Bokov, O. V.. Ilyukhina, G.. Duplâtre, V. M.. Byakov. Interaction of positronium with dissolved oxygen in liquids

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